

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

C.A. No. 1:19-cv-12551-FDS

Hon. F. Dennis Saylor IV

**DEFENDANT GOOGLE LLC'S REPLY IN SUPPORT OF ITS MOTION TO
EXCLUDE CERTAIN OPINION TESTIMONY OF PHILIP GREEN**

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As Google’s Daubert motion showed (and Singular largely concedes), the smallest salable patent-practicing unit (SSPPU) encompassing Singular’s purported invention is at most the TPU chip.¹ And, although Singular’s opposition repeatedly implies that its damages expert’s theory is based on the value of an individual TPU chip, a careful reading shows that Singular concedes the primary error that warrants exclusion of Phillip Green’s opinion under *Daubert*: his royalty base is premised on cost savings supposedly attributable to TPU *systems* that combine anywhere between 16 and 1,024 chips, a royalty base which—contrary to law—includes the value of numerous unpatented features. Indeed, as Singular’s opposition claims: “Mr. Green . . . determines the costs Google saved by using the infringing TPU chips rather than the next best acceptable non-infringing GPU chips by comparing the chips *in the context in which Google actually uses them – in its machine learning systems.*” Opp. at 11 (emphasis added). Mr. Green’s failure to use the SSPPU violates the entire market value rule (EMVR). The impact of Mr. Green’s use of purported cost savings due to Google’s entire “machine learning (TPU) systems” is not small—by violating the entire market value rule, he inflates the royalty base at issue here to as much as [REDACTED].

Mr. Green also compounds his royalty-base error by using two flawed apportionment calculations and assumes, contrary to case law and rudimentary economics, that *all* purported cost savings from using the patented invention would go to Singular in a hypothetical negotiation. Based on these multiple, independent legal errors, Singular intends to have Mr. Green offer various unreliable, highly speculative, and prejudicial opinions that Singular’s purported damages here fall within [REDACTED] range (from [REDACTED]), from which—per Singular—it will be the jury’s responsibility to decipher the right amount.

Mr. Green’s damages opinions are irreconcilable with Federal Circuit case law, much of which Singular ignores and none of which Singular counters. Instead, Singular’s opposition mischaracterizes the cases directly on point and rewrites Mr. Green’s report and deposition

¹Although the SSPPU may be a sub-component of the TPU chip, for purposes of this motion, Google assumes the broadest possible SSPPU: the TPU chip. *See also* Mot. at 7-9.

testimony to obfuscate these compounding errors. Mr. Green’s damages opinions are unreliable, prejudicial, misleading, and should be excluded.

I. ARGUMENT

A. Mr. Green’s analysis violates the entire market value rule.

Mr. Green’s failure to derive his royalty base from the SSPPU—the TPU chip—is legally improper and renders his [REDACTED] damages model inadmissible. *See* Mot. 6-13. Where, as here, “multi-component products are involved . . . the ultimate combination of royalty base and royalty rate must reflect the value attributable to the infringing features of the product, **and no more.**” *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014) (emphasis added). Thus, courts require “that royalties be based not on the entire product, but instead on the ‘smallest salable patent-practicing unit.’” *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 67 (Fed. Cir. 2012). Contrary to this doctrine—the “entire market value rule” (EMVR)—Mr. Green premises his royalty base on the costs related to complete TPU *systems*, which the parties agree contain many unaccused features and components. Mr. Green’s failure to base his royalty calculation on the SSPPU renders his testimony unreliable and highly prejudicial. Singular’s efforts to evade the EMVR lack both legal and factual basis.

1. The entire market value rule applies here.

As an initial matter, Singular raises several arguments claiming that the EMVR does not apply here. None hold water.

First, Singular argues that “neither the EMVR nor the SSPPU doctrine apply to Mr. Green’s methodology” because “this case does not involve revenues generated by the sale of an end product.” *Opp.* at 11, 14. Notably, Singular cites no case law in support of its argument. *See Opp.* 13-15. Nor does Singular explain why such an exemption would make sense.

In fact, courts have explicitly applied the SSPPU and EMVR doctrines to strike reasonable royalty analyses based on cost-savings models to prevent the risk of unfair prejudice. *See, e.g., Microchip Tech. Inc. v. Aptiv Servs. US LLC.*, 2020 WL 5203600, at *6 (D. Del. Sept.

1, 2020). The facts of *Microchip* are on all fours here: the damages expert there evaluated cost savings based on a multi-component system instead of the sub-component chip. 2020 WL 5203600 at *6. Although Singular attempts to recast *Microchip* as a case about revenue (notably without a single quote), the court in *Microchip* was clear: the patentee’s expert “was not permitted to use the [entire multi-component system] as the base for his **cost-savings analysis**,” because the expert failed “to look at the **cost savings at the chip level, not the device level**.” *Id.* at *5. Mr. Green similarly cannot use the entire multi-component TPU system as a basis for his cost-savings analysis, as he fails to look at the cost savings at the chip level. As the *Microchip* court found, “[an expert’s] use of a cost-savings approach d[oes] not excuse him from th[e] **obligation**” to “narrow[] the focus to the smallest patent-practicing unit.” *Id.* at *6.

Second, Singular contends that EMVR case law does not apply because “Google developed the infringing TPUs for use in its own machine learning systems and it does not market for sale to third parties the chips or the TPU boards.” Opp. at 14. Singular is wrong, both legally and factually. As to the law, the Federal Circuit is clear that EMVR applies regardless of whether a company markets an accused product for sale to third parties or only uses the product internally. *Versata Software, Inc. v. SAP Am., Inc.*, 717 F.3d 1255, 1268 (Fed. Cir. 2013). To argue otherwise, Singular ignores half of the EMVR standard described by the Federal Circuit: the patented feature must either “create[] the basis for customer demand **or substantially create[] the value of the component parts**” to use a multi-component product’s entire market value as a royalty base. *Id.* (emphasis added). As to the facts, as Mr. Green acknowledges in his report, Google markets its TPUs to consumers via its Cloud TPU business, which allows customers to purchase remote access to the TPUs for use on machine learning workloads. Green Report at 96 (noting that Google “sells or has sold its TPUs” as a part of “its Cloud TPU business”; see also Dkt. No. 510-14 (“Stamm Report”) at 20 (same)).

2. Mr. Green improperly uses the entire market value of TPU systems for his royalty base instead of the SSPPU—TPU chips.

Next, Singular claims that “Google does not challenge Mr. Green’s reliance on this cost savings methodology. It only challenges his comparison of TPU and GPU performance as used in machine learning systems.” Opp. at 13. That is like saying Google agrees Mr. Green did the math right, it only argues that he used the wrong numbers in his calculation.

For the reasons explained in Google’s opening brief, the SSPPU here is the TPU chip. Mot. at 7-8. Perhaps the parties now agree on that. Singular’s technical expert has conceded that under Singular’s infringement theory, the relevant limitations of the Asserted Claims involve only a subset of the components found on individual TPU *chips*. *See id.* In its opposition Singular never disputes that the TPU chip is the SSPPU, nor does it offer an alternative SSPPU.

Mr. Green failed, however, to base his analysis on the TPU *chip*. Singular’s opposition and the sources it cites make that clear. For example, although Singular says that Exhibit K to Mr. Green’s report shows that he calculated Google’s cost savings based on the “TPUv2 and TPUv3 chips,” *nowhere* does Exhibit K reference TPU *chips*; instead, Exhibit K explicitly and repeatedly refers to TPU *systems*. *See* Green Rpt., Exhibit K. Furthermore, Singular’s Opposition concedes that Mr. Green’s “royalty range of [REDACTED]” is *not* limited to the TPU chip because it states that Singular’s purported damages would be different if the TPU chip was the SSPPU—“as much as [REDACTED]” rather than [REDACTED].² Opp. at 16, 19.

Mr. Green’s report and his deposition testimony leave no doubt that he is apportioning value to TPU systems rather than to TPU chips. The following examples are far from exhaustive:

- Mr. Green summarizes his findings in his report as “the cost savings Google has benefited from through deploying the TPUv2 and TPUv3 *systems*,” not chips. Dkt. No. 507-2 (“Green Report”) at 65 (emphasis added).
- Mr. Green explains how a document he uses to calculate the number of GPUs Google purportedly would have bought “shows a system level comparison” between GPUs and TPUs. *Id.* at 67 n. 461.

² The Court should reject Singular’s attempts to rewrite Mr. Green’s damages analysis in its Opposition, given that Mr. Green has provided no expert analysis or opinion to support this figure. Moreover, this figure suffers from the same independent and fatal errors described below.

- Mr. Green’s entire analysis on “Accelerator Cost Savings of Accused TPUv2 Accelerators” refers repeatedly to system-level comparisons instead of chip-level. *See id.* at 65-68 (Section V.C.1.a).
- Mr. Green testified that he performed a system-level analysis because “these chips are being run in systems and they’re being run at scale.” Green Tr. at 171:3-13.

Based on all this, there can be no doubt that Mr. Green’s analysis and testimony rely on TPU *systems* instead of *chips*. As explained in Google’s opening brief and discussed below, that mistake vastly inflates the value of Green’s royalty base—to as much as [REDACTED]—by crediting the Asserted Claims with significant benefits Google derives from using non-accused TPU system features that are wholly unrelated to the accused TPU chip. *See Mot.* at 13. For example, Mr. Green’s royalty-base analysis includes the value of the interconnects between the hundreds of chips in a TPU system, an unaccused feature which Google’s internal documents credit as being the driver of system performance. *Id.* at 8-10.

3. Mr. Green cannot cure his violation of the EMVR via apportionment.

Singular’s final attempt to erase Mr. Green’s violation of the EMVR is an argument that “Mr. Green properly apportions the cost savings to consider the value contributed by the patented technology.” Opp. at 15. But the case law that Singular ignores confirms that Mr. Green cannot cure his failure to use the SSPPU in determining his royalty base by purporting to apportion out the numerous other components of a TPU system that are not accused of infringement. *See Opp.* at 13-15. In *LaserDynamics*, the patentee’s expert failed to explain how the accused intra-chip functionality created cost savings across the system as a whole, as opposed to at the chip or component level. Although the expert had apportioned down to 2% of the system’s total sales, the Federal Circuit found the expert still violated the entire market value rule because “the royalty was expressly calculated as a percentage of the entire market value of a laptop computer rather than a patent-practicing [component].” 694 F.3d at 68; *see also Microchip*, 2020 WL 5203600, at *6 (no apportionment can cure expert’s failure to use SSPPU).

Mr. Green’s failure to perform his analysis properly leads to more than just a theoretical error—it has a very large and real impact given the evidence before him. Singular cites the

“Patterson Memo” throughout its Opposition as an example of how Google compares the “use of TPUv3 chips to . . . GPUs in complete **systems**.” Opp. at 3 (emphasis added). But the Patterson Memo demonstrates exactly how Mr. Green manipulates system-level data even when provided with contrary chip-level data *on the same page*. For example, the Patterson Memo contains chip-level comparisons that show that TPUs and GPUs have *identical performance* metrics. See Dkt. No. 507-3 (“Patterson Memo”) at 2. Instead of addressing that chip-level data in his analysis in any way, Mr. Green inexplicably skips to system-level comparisons to assert that “Google would have to purchase and operate 4.8x as many GPUs” as TPUs, a multiplier he uses in his final [REDACTED] model. Opp. at 3. In so doing, Mr. Green tries to capture the value of other, unaccused aspects—including, for example, the interconnects that drive TPU performance via scaling.

As explained in Google’s opening brief, Mr. Green reviewed numerous documents like the Patterson Memo that compare TPUs to GPUs at the *chip* level, yet he ignored those documents. See Mot. at 13. And Singular does not deny that “[a]ny purported difference between TPU and GPU performance exists at the *system* level, untethered to the Asserted Claims and Singular’s purported invention.” *Id.* (emphasis added). Given these facts, there is no acceptable explanation or excuse for Mr. Green’s failure to use the TPU chip as the SSPPU. Nor does the existence of both chip- and system-level comparisons mean that Mr. Green can present whichever comparison he prefers to the jury, “aiming for the highest royalty base” instead of conducting the SSPPU analysis required by case law. See *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 287-88 (N.D.N.Y. 2009) (excluding expert testimony because, instead of choosing the SSPPU, patentee relied on “a royalty base claim encompassing a product with significant non-infringing components”). As explained in *Microchip*, Singular’s failure to use the proper SSPPU and violation of the EMVR cannot be cured by apportionment or cross-examination. See, e.g., *Microchip*, 2020 WL 5203600, at *6 (holding the risk is too high to present such testimony to the jury). Mr. Green’s analysis is legally improper and renders his [REDACTED] damages model inadmissible and highly prejudicial.

B. Mr. Green’s apportionment is unsupported and unreliable.

Mr. Green’s apportionment testimony should also be excluded because he failed to limit his reasonable royalty to the incremental value that the patented invention adds to the end product³, putting his opinion at odds with “the essential requirement for reliability under *Daubert*.” *Commonwealth Sci. & Indus. Rsch. Org. c. Cisco Sys., Inc.*, 809 F.3d 1295, 1301 (Fed. Cir. 2015); *see also* Mot. at 13–17. Mr. Green’s apportionment takes two forms, both of which suffer from fatal errors. **First**, as explained in Google’s briefs seeking to exclude Dr. Khatri’s opinions, Mr. Green’s wholesale reliance on Dr. Khatri’s flawed apportionment analysis renders Mr. Green’s technical apportionment analysis unreliable as well. *See* Dkt. No. 480. Singular’s only response, that Mr. Green’s reliance here was “reasonable,” fails to provide any case law, or other justification, for allowing Mr. Green to sponsor the flawed analysis of another expert. *See* Opp. at 17. **Second**, Singular effectively concedes that Mr. Green’s 23% accounting apportionment is improper as it is based on “differences between the non-infringing alternatives (“NIAs”) and the Accused Products.” *See* Mot. at 16-17. A proper analysis should be tied to “the incremental value that the *patented invention* adds to the end product.” *Commonwealth*, 809 F.3d at 1301. Although Singular argues in opposition that Google “mischaracterizes Mr. Green’s accounting apportionment,” Singular does not and cannot explain Mr. Green’s failure to apportion the incremental value of the patented invention as opposed to NIAs. *See* Opp. at 17. His 23% accounting apportionment should be excluded as it ignores the value of the patented invention to the end product.

C. Mr. Green arbitrarily allocates all of Google’s cost savings to Singular.

Google also moved to exclude Mr. Green’s damages opinion because, contrary to “both rudimentary economics and common sense,” his analysis depends on the notion that *all* of Google’s purported savings from using the patented technology would go to Singular in a hypothetical negotiation. Mot. at 17-19. Because Google would not benefit from bargaining

³ Mr. Green’s 50% cost-allocation, which has no technical or factual basis, only underscores these errors. *See* Mot. at 16-17.

away all its avoided costs, 100% of those costs cannot possibly be “the royalty upon which the parties would have agreed had they successfully negotiated an agreement just before infringement began.” *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1324 (Fed. Cir. 2009).

In its opposition brief, Singular does not dispute Google’s understanding of the law, *i.e.*, that an expert’s testimony should be excluded when it presumes that all cost savings would go to the patentee. Opp. at 18. Nor does Singular dispute the fact Mr. Green’s damages analyses start with the cost savings Singular claims are attributable to the patented technology. And Singular also concedes that Mr. Green’s *only* allocation of cost savings to Google is a discount rate.

What Singular ignores, however, is that Mr. Green’s application of a discount rate effectively *still* allocates all of Google’s cost savings to Singular. *See* Mot. at 17-18. That is the precise holding of *Looksmart Grp., Inc. v. Microsoft Corp.*, 2019 WL 4009263 (N.D. Cal. Aug. 5, 2019). Although it is on all fours here, Singular does not address or even acknowledge *Looksmart*. There, the court explained that applying a discount rate alone is not sufficient to allocate costs to a purported invention because the discount rate “accounts only for the time value of money and the standard risk involved in an equity investment.” *Id.* at *3 (citing *Energy Capital Corp. v. United States*, 302 F.3d 1314, 1333 (Fed. Cir. 2002)). “Thus, the purpose of applying a discount rate is not to allocate [a percentage] of [Google]’s avoided costs to [Google], but to make sure that [Singular]’s avoided costs figure represents [Google]’s true avoided costs.” *Id.* In *Looksmart*, the court made clear that applying a discount rate to the defendant’s purported cost savings and allocating the rest to the patentee effectively “allocates all of [the alleged infringer’s] avoided costs to” the patentee. *Id.* Singular does not cite a single case to the contrary.

Singular’s opposition makes the Court’s task simple: by Singular’s own account, Mr. Green assumes that, after applying a discount rate, *all* of Google’s purported cost savings are allocated to Singular. Mr. Green’s proffered testimony is analytically *identical* to the testimony excluded in *Looksmart*. The same result is warranted here.

D. Mr. Green’s opinion that damages range “up to [REDACTED]” is too speculative to assist the jury and should be excluded.

As Google’s opening brief made clear, Mr. Green has not identified a sufficiently precise damages amount. Instead, Mr. Green intends to “provide the trier of fact with a range” of potential damages that vary between [REDACTED]. Green Depo at 49:7-10; 50:24-51:9. Singular’s plan to have Green testify to a staggering [REDACTED] range of potential damages runs afoul of both Rule 702 and Rule 403 for the reasons stated in Google’s opening brief. Mot. at 19.

Singular’s Opposition essentially concedes that Mr. Green plans to present an enormous, [REDACTED] damage range at trial. *See* Opp. at 19 (“Mr. Green’s application of his alternative apportionment methods and consideration of damages . . . creates a royalty range of [REDACTED].”). Instead, Singular argues that presenting the jury with a wide range of potential damages amounts is appropriate and determining damages is solely the purview of the jury. *See* Opp. at 19. That is incorrect. Mr. Green’s testimony should be stricken because a range of [REDACTED] would neither “help the trier of fact to understand the evidence” under Rule 702; nor would its probative value outweigh the risk that it misleads the jury under Rule 403.

Singular points to two cases to defend Mr. Green’s testimony. Neither case allows an expert to testify to the breathtaking [REDACTED] range that Singular intends to present in this case. First, *Summit 6, LLC v. Samsung Elecs. Co., Ltd.*, did not involve a range at all. The word “range” appears once in the entire opinion. In setting forth the applicable legal standard for challenges to a damages expert’s testimony, the court merely acknowledged that in a given case the “record *may* support a range of reasonable royalties, rather than a single value.” 802 F.3d 1283, 1296 (Fed. Cir. 2015) (emphasis added). That is not controversial or germane.

The second, *Bayer Healthcare LLC v. Baxalta Inc.*, 989 F.3d 964, 983 (Fed. Cir. 2021), is no more helpful for Singular. In it, the district court granted a *Daubert* motion, excluding an expert’s testimony as to a specific damages figure, which was based on an unsupported theory. As a result, the expert was able to opine only on the range of potential damages identified in his report. At most, this case stands for the—again, uncontroversial—proposition that, in certain

cases, a range of royalties may be presented to the jury. But permitting testimony as to a range is not the same thing as permitting testimony regarding a [REDACTED] range. Singular has not cited a single case in which a damages expert has been permitted to testify to a range of potential damages that comes within an order of magnitude of the span that Singular hopes to put before the jury here. (The range in *Bayer* was roughly [REDACTED] of what Mr. Green would present here.)

Allowing Mr. Green to testify that damages in this case are somewhere within a range of [REDACTED] without any further guidance will serve only to confuse the jury, lead to improper speculation, and prejudice Google by infecting the jury with artificially large damages figures. *See SiOnyx, LLC v. Hamamatsu Photonics K.K.*, 2019 WL 13180450 at *2 (D. Mass. Apr. 18, 2019) (holding that expert testimony “may nonetheless be excluded” pursuant to Fed. R. Evid. 403 “if it is likely to be misinterpreted or misused by the jury”). Mr. Green’s testimony should be excluded for this reason, as well.

E. The parties agree that Mr. Green should not be permitted to regurgitate Singular’s factual narrative of the case.

Singular does not counter the final legal argument raised in Google’s Motion. Mot. at 20. Google seeks to exclude two portions of Mr. Green’s report and testimony that veer beyond the bounds of expert testimony and into attorney argument: (1) Section IV.C.3, which purports to provide an “Overview of [the] Relationship between Singular and Google (2011 – 2017),” Green Rpt. at 27-34; and (2) Mr. Green’s discussion of the parties’ “relationship” purportedly with regard to *Georgia-Pacific* Factor 5. *See, e.g., id.* at 92, 108. Because Mr. Green lacks any personal knowledge of the parties’ “relationship” and provides no expert analysis related to it, his testimony would simply repeat the factual narrative Singular intends to tell the jury. Such testimony should be excluded for the reasons stated in Google’s opening brief.

In its opposition, Singular does not question that experts should be barred from parroting a party’s factual narrative or regurgitating attorney argument. Instead, Singular says it “does not intend” to elicit testimony from Mr. Green that would repeat its factual narrative or describe “Google’s intent or state of mind.” Opp. at 20. Instead, Mr. Green will merely “discuss the

parties' relationship at the time of the negotiation . . . [to] assist the jury in recreating the hypothetical negotiation." *Id.* Such assurances provide little comfort.

There is no dispute that Mr. Green—and Google's economic expert, Ms. Stamm—may be permitted to compare the parties' respective circumstances as part of their reasonable royalty analysis under *Georgia-Pacific*. But damages experts cannot use the limited scope of such analysis as pretext to sponsor factual narratives, attorney argument, and speculation about a party's state of mind. *See, e.g., United Servs. Auto. Assoc. v. Wells Fargo Bank, N.A.*, 2019 WL 6896674, *2-3 (E.D. Tex. Dec. 18, 2019) (excluding expert testimony regarding the parties' interactions because it "contains no expert analysis that would help the trier of fact"). Yet, that is exactly what Section IV.C.3 of Mr. Green's report seeks to do. That portion of the report spans 8 pages, repeats Singular's narrative of the case (devoid of any economic analysis), and culminates in Mr. Green's bald assertion that Google has "stolen" Singular's technology. Green Rpt. at 34. This restatement of Singular's version of the facts (which Google will disprove at trial) is not testimony regarding *any Georgia-Pacific* factor and has no place in an expert report, much less the report of a *damages* expert like Mr. Green.

Singular argues that Mr. Green's testimony about the "relationship" between the parties is proper under *Georgia-Pacific* Factor 5. Consistent with Factor 5, Mr. Green acknowledged that the parties are not competitors and that fact "generally results in a lower royalty rate." Green Rpt. at 91-92, 108. But, Mr. Green goes on to opine that this general rule would not apply here because Singular's technology was "significant to [Google's] business operations" and "Google realized that its TPU program included technology that had been discussed with Google by Dr. Bates." *Id.* This opinion amounts to an improper, unqualified infringement opinion from an economic expert. Moreover, it relies entirely on Mr. Green's speculative characterization of Google's state of mind and should be excluded. *OneBeacon Am. Ins. Co. v. Com. Union Assurance Co. of Can.*, 804 F. Supp. 2d 77, 85 (D. Mass. 2011), *aff'd*, 684 F.3d 237 (1st Cir. 2012) ("A party's intent or state of mind is not the proper subject of expert testimony.").

II. CONCLUSION

For the reasons stated above, Google respectfully requests the Court to enter an Order to exclude portions of Mr. Philip Green's testimony.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that this document is being filed through the Court's electronic filing system, which serves counsel for other parties who are registered participants as identified on the Notice of Electronic Filing (NEF). Any counsel for other parties who are not registered participants are being served by first class mail on the date of electronic filing.

/s/ Nathan R. Speed

Nathan R. Speed